

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: GAECHTER, Jean-Pierre

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ART UNIT: 3682

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EXAMINER: Pilkington, J.

TITLE: MECHANICAL ACTUATOR INCLUDING A HELICAL-CAM NUT

Amendment B: REMARKS

Upon entry of the present amendments, previous Claims 19 - 36 have been canceled and new Claims 37 - 52 substituted therefor. Claims 1-18 were previously canceled. Reconsideration of the rejections, in light of the forgoing amendments and present remarks, is respectfully requested. The present amendments have been entered for the purpose of further distinguishing the present invention from the prior art patents.

In the Office Action, Claims 19 - 26, 28, 29 and 31 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the Hogan patent in view of the Brusasco patent. Claim 27 was rejected as being obvious over the Hogan patent in view of the Brusasco patent. Claim 30 was rejected as being obvious over the Hogan patent in view of the Brusasco patent and further in view of the Barrett patent. Claim 32 was rejected as being obvious over the Hogan patent in view of the Brusasco patent and further in view of the Gould patent. Claim 36 was rejected as being obvious over the Hogan patent in view of the Brusasco patent and the Gould patent and further in view of the Devenyi patent. Claim 34 was rejected as being obvious over the Hogan patent in view of the Brusasco patent and further in view of the Halasy-Wimmer publication. Claim 35 was rejected as being obvious over the Hogan patent in view of the Brusasco patent and further in view of the Yapple patent. Claim 36 was rejected as being obvious over the Hogan patent in view of the Brusasco patent and further in view

of the Laskey patent.

As an overview to the present reply, Applicant has revised the previous claim language in the form of new Claims 37 - 52. In particular, new independent Claim 37 incorporates the limitations of previous independent Claim 19, along with the limitations of previous dependent Claims 23 and 30. In particular, it is now indicated that the nut assembly comprises "a plurality of aligned elements". Each of the aligned elements has "a generally cylindrical shape with at least one bevel forming a helical cam surface". It is further indicated that the helical cam surfaces of adjacent elements define a portion of the helical ball race. It is further indicated that the driving means includes "a motor that is mounted in a fixed position inside the inner tubular body". Applicant respectfully contends that these features serve to distinguish the present invention from the prior art Hogan and Brusasco patents.

Applicant respectfully contends that the Hogan patent fails to show the nut assembly as having "helical ball races". Additionally, in the Hogan patent, the outer tubular body does not contain "helical ball races suitable for guiding the plurality of balls". The Hogan patent further fails to show the motor "mounted in a fixed position inside the inner tubular body". Additionally, and furthermore, the Hogan patent does not show "the plurality of aligned elements forming a helical cam surface". As such, Applicant respectfully contends that these features of the present invention are not shown in the Hogan patent.

Relative to the obviousness of such structure, it is important to note from the Hogan patent in column 1, lines 20 - 35, that:

In ball screw and nut mechanisms as well as in the conventional screw and nut constructions, the rate of axial travel of one of the members for a given rotary speed of the other is primarily

governed by the pitch of the helical ball channels or screw threads respectively. In the case of ball screw and nut, the pitch of the helical ball channel is limited by the size of the balls, and in the conventional screw and nut construction the pitch of the thread is limited by the size of the screw threads required to carry the intended load. Thus, when axial motion of one of the members is required at a rate lower than that obtainable by the smallest possible pitch of either the ball channel or screw threads, the mechanism must be provided with a speed reducing means such as a gear train or the like, which increases the cost of manufacture as well as the size and weight of the unit.

Thus, in order to overcome these problems, it is stated in column 1, lines 36 - 40 of the Hogan patent that:

It is therefore the main object of this invention to provide a device through which relatively high speed rotary motion of one driving member can be directly translated into extremely low speed linear motion of a driven member.

The construction according to the Hogan patent has a ball screw and nut device in which the pitch of the screw is defined by two juxtaposed discs 28 or by one disc 28 with and end disc 29 or 30. This pitch is completely incompatible with any raceway whatsoever formed on the inner side of the tube 34. This is clearly stated in the description in the Hogan patent.

In addition, since the raceway defined by two juxtaposed discs 28 includes a very small pitch, the outer tube 34 or "driven member" should be provided internally with as many helical raceways as there are raceways. As such, this is provided on the screw or driving member 22.

As such, the Hogan patent discloses a ball device which can operate only by friction. As a matter of fact, because this device is completely incompatible with a race track, provided by the tube 34 or "driven member".

Additionally, in the Hogan patent, in order to operate by friction it is necessary to tighten the screw 24 in order to achieve the tightening of the discs 28, 29, and 30 and to push the balls back

radially against the inner wall of the tube 34. Under such circumstances, it is only by tightening the discs 28, 29, and 30 that one acts on the nominal diameter of the raceway as defined by two successive discs. By changing the nominal diameter of the raceway, one is able to change its pitch. As such, one having ordinary skill in the art would understand that, because of the bringing of the discs closer to each other, the distance between the threads on a screw could also vary. In other words, one having ordinary skill in the Hogan patent would conclude that it would not be possible to achieve the object of the present invention, in particular, since the driving member 22 would not be compatible with a internal race track of the driven member 34. As such, the Hogan patent would teach against the construction of the present invention, as defined herein.

The Brusasco patent describes a screw in the form of a tree that is mounted on a rolling groove defined by the spiral of a spring. The balls move by cooperation with the concave coils of the spring in association with a rolling groove in the nut. Because of the nature of the spring that defines the rolling groove on the screw, the pitch of the rolling groove can vary. As FIGURE 3 illustrates, a pair of nuts are mounted on this screw. Each of the nuts has a different pitch. On this basis, since the Brusasco patent would teach away from the objectives of the Hogan patent, Applicant respectfully contends that one having ordinary skill in the art would not be likely to combine the teachings of these prior art patents in order to achieve the present invention.

Fundamentally, the prior art patents fail to show the driving means as comprising a motor mounted in a fixed position inside the inner tubular body. As such, the "driving means" of the present invention as used for the "translation" of the outer tubular body relative to the inner tubular body would not be shown in the prior art combination. On this basis, Applicant contends that independent Claim 37 is patentably distinguishable from the prior art.

Dependent Claims 38 - 40 correspond, respectively, to the limitations of previous dependent Claims 20 - 22. Dependent Claims 41 - 44 correspond, respectively, to the limitations of previous dependent Claims 24 - 27. Dependent Claims 45 and 46 correspond, respectively, to the limitations of previous dependent Claims 28 and 29. Dependent Claims 47 - 52 correspond, respectively, to the limitations of previous dependent Claims 31 - 36.

Based upon the foregoing analysis, Applicant contends that independent Claims 37 is now in proper condition for allowance. Additionally, those claims which are dependent upon Claim 37 should also be in condition for allowance. Reconsideration of the rejections and allowance of the claims at an early date is earnestly solicited. Since no new claims have been added above those originally paid for, no additional fee is required.

Respectfully submitted,

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